Climate Change and Navigat

International Navigation Association

Environmental Commission – EnviCom

Chairman
Harald Köthe

Vice-Chair and Secretary
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Are We Ready for Climate Change?

- Climate change effects
  - Visible regionally and expected to increase in coming decades
  - Impacts to inland and maritime navigation
- Changes in hydrologic balance of watersheds translates into loss of reliable drafts
- New marine/polar navigation routes emerging
- Navigation infrastructure projects in planning and implementation must address potential effects

Addressing Future of Uncertainties through Planning Scenario Analyses

- European Commission concept: "**climateproofing**":

  "Ensuring the sustainability of investments over their entire lifetime, taking explicit account of a changing climate."

- US Example: Louisiana Coastal Protection and Restoration (LACPR) Project
  - No single most probable future
  - Multiple future scenario analyses

- Scenarios become important drivers in all future planning processes

Navigation Needs in Addressing Climate Change

- **Climate protection –** Ways navigation can reduce its greenhouse gas emissions
- **Climate adaptation –** Understanding how navigation will be affected and what compensating measures are necessary

Strategies

- Develop knowledge base across PIANC
- Communicate challenges to navigation sector
- Distribute technical guidance
- Energize response

First Step: EnviCom Task Group 3

- Reviewed climate change drivers, impacts, responses and mitigation for navigation sector
- March 2007 – April 2008
- Diverse interdisciplinary team
  - Climate change specialists (meteorologists and forecasters), hydrology experts (water balance and discharge specialists), oceanographers, maritime / inland navigation hydraulic engineers
- Participating countries:
  - Germany, United Kingdom, USA, France, Norway
  - Corresponding: Belgium, Spain, Australia, Japan, South Africa

EnviCom Task Group 3

International Navigation Association
Environmental Commission - EnviCom

Task Group 3
Climate Change and Navigation

Waterborne transport, ports and waterways:
A review of climate change drivers, impacts, responses and mitigation

Report printed in
May 2008

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TG 3 Report Contents

- Discussion on relevance of climate change for maritime and inland navigation
- Description of realistic impact scenarios
  - e.g. environmental, technical, economic, political
  - Documentation of existing uncertainties with the use of climate models
- Summary of potential impacts on navigation
  - Inland navigation
  - Maritime navigation
- Examples where climate change is presently causing problems for navigation

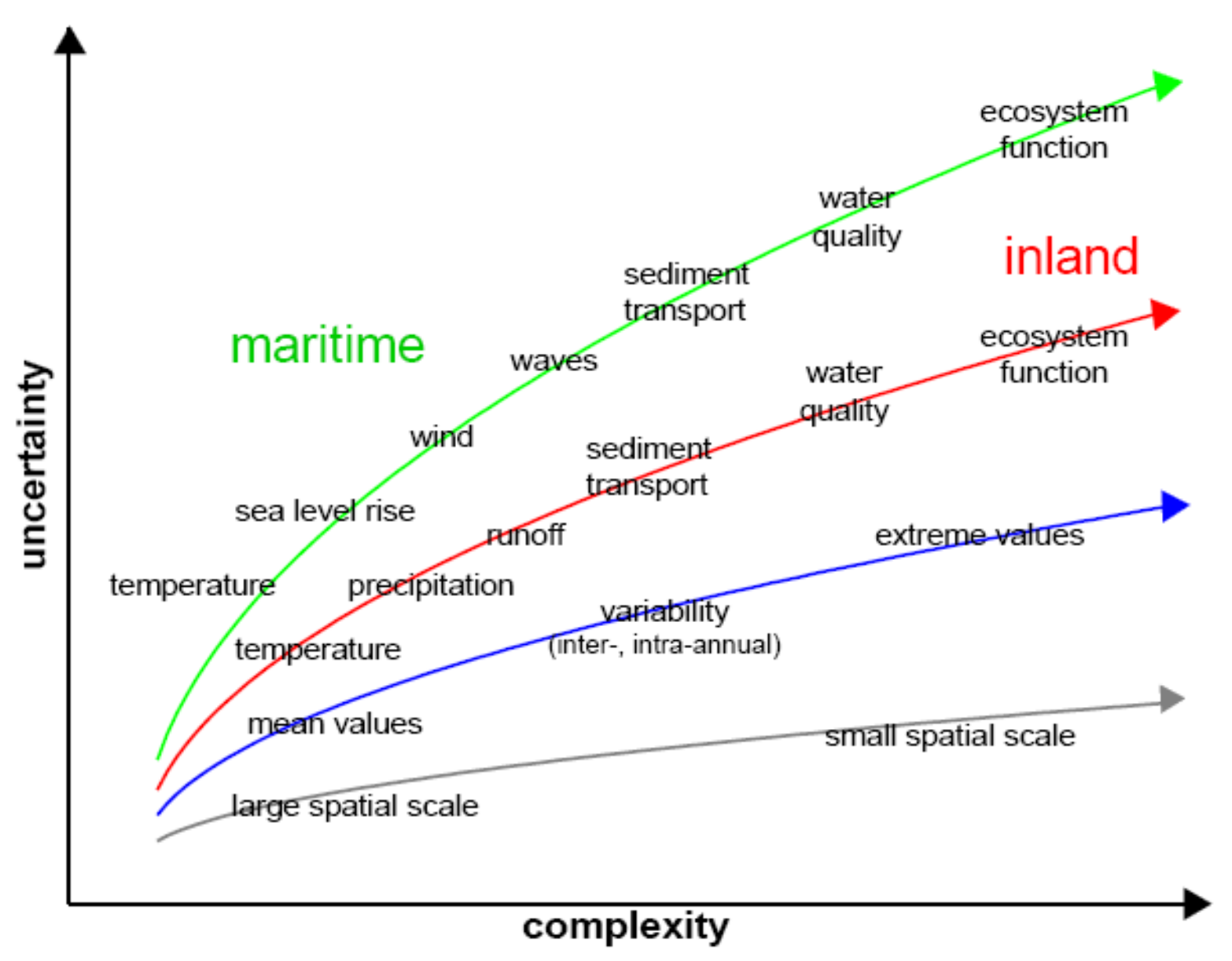
TG 3 Report Contents (cont.)

- Identification of measures that navigation can take to contribute in reduction of climate change impacts:
  - e.g. reduction of CO2 emissions and alternative fuel concepts
  - Benefits of navigation as environmentally sound and sustainable mode of transportation
- Description of responses required to:
  - Prepare navigation sector for projected climate scenarios
  - Adapt navigation infrastructure, equipment, and daily practice for future sustainability

Literature Review

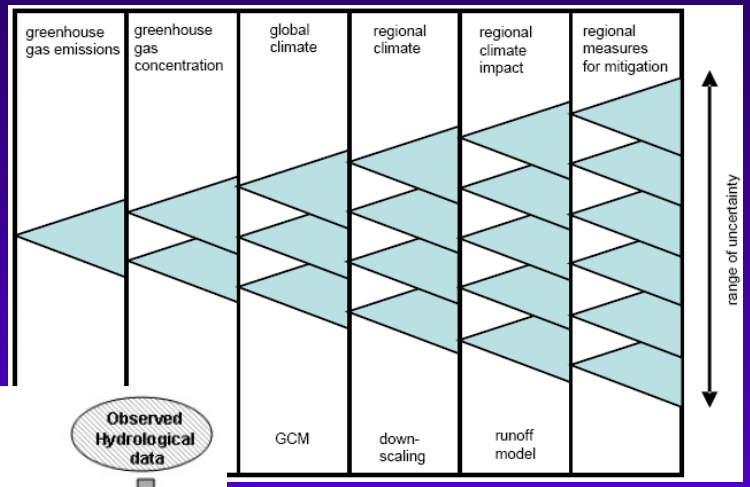
- Large-scale climatic processes driven by ocean-atmosphere exchange system
- Few studies available on maritime impacts compared to studies on land-based human consequences
- Must deduce impacts on navigation from research undertaken in specific fields
  - e.g. coastal risks, water supply, nuclear plant protection
  - IPCC Working Group 2 reports
- TG 3 adopted same terminology in its discussion of climate impacts as latest IPCC report

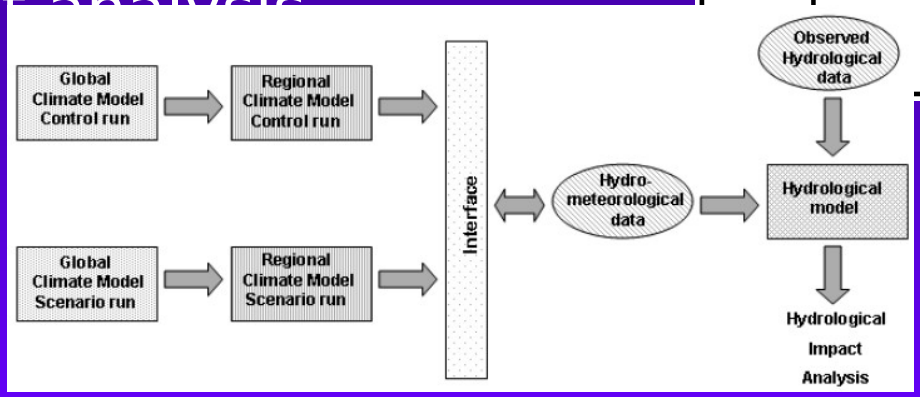
Relationship of Uncertainty and Complexity



Dealing with Uncertainties

- Ranges of uncertainty
  - Greenhouse gas emissions and concentrations
  - Global and regional climate change
  - Regional climate impact
  - Regional offsetting measures
- Methodology for coupling climate and hydrologic models for impact analysis

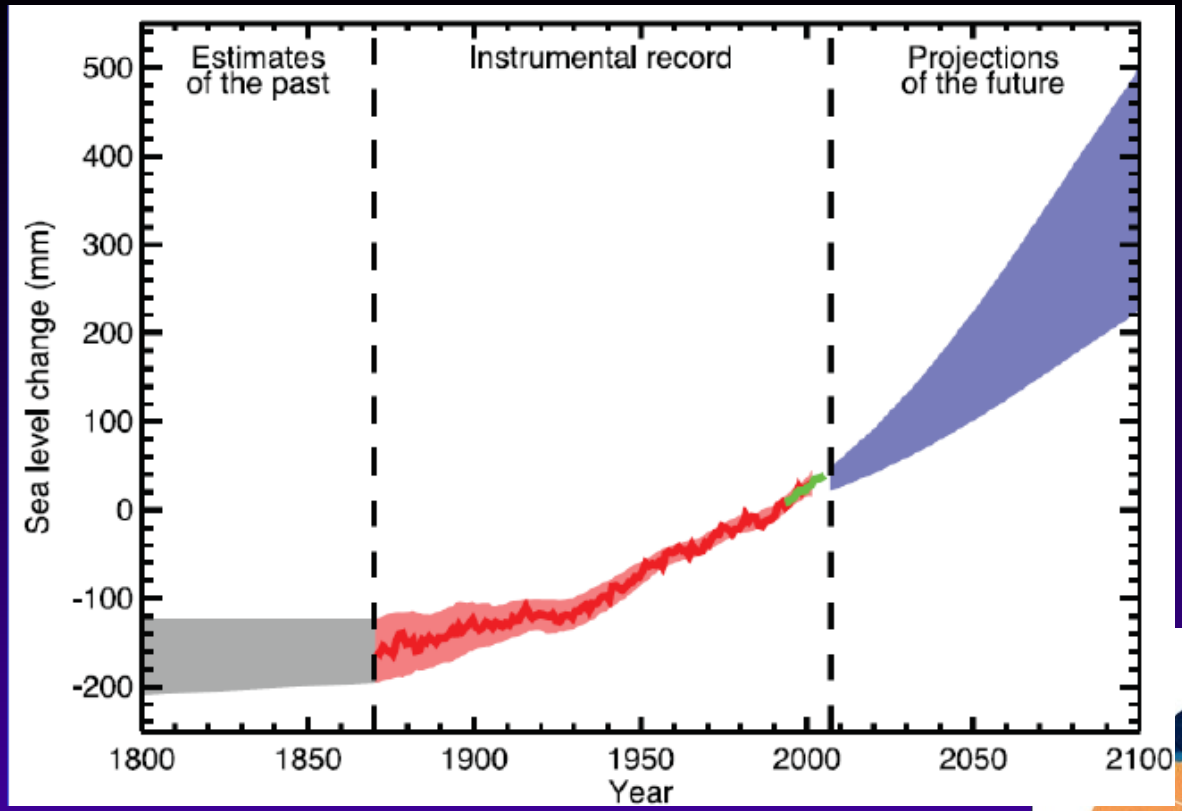




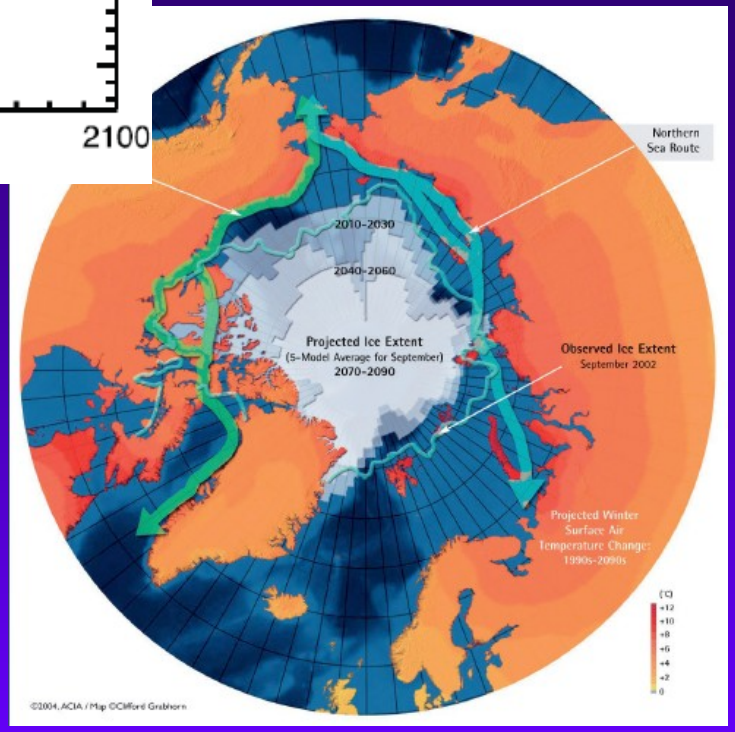
Climate Change Effects, Associated Impacts, and Potential Responses for Maritime Navigation

- Sea level
- Winds and waves
- Tides and surges
- Ocean circulation patterns and coastal hydrodynamics
- Coastal and estuarine morphology
- Storm event frequency / intensity
- Sea chemistry
- Designated environmentally protected areas
- Ice conditions and icing affects

Maritime Navigation Examples



Sea level change



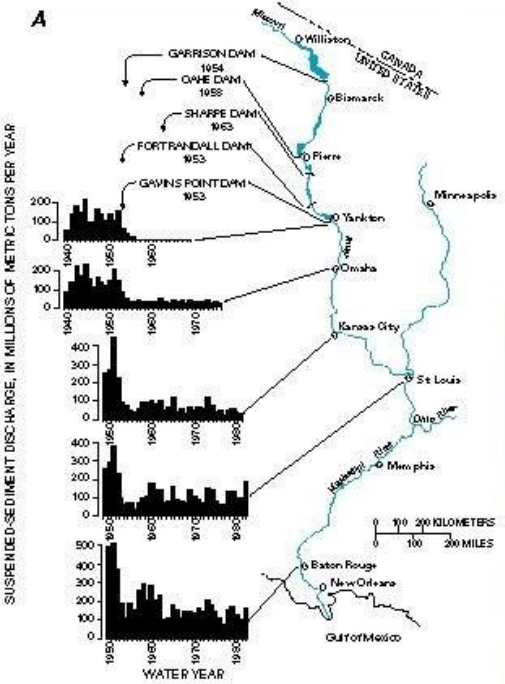
Evolving artic navigation passages

Climate Change Effects, Associated Impacts, and Potential Responses for Inland Navigation

- Water supply / surface elevations in navigable rivers
- Water temperature
- Extreme hydrological conditions
- River morphology
- Changes in ice cover

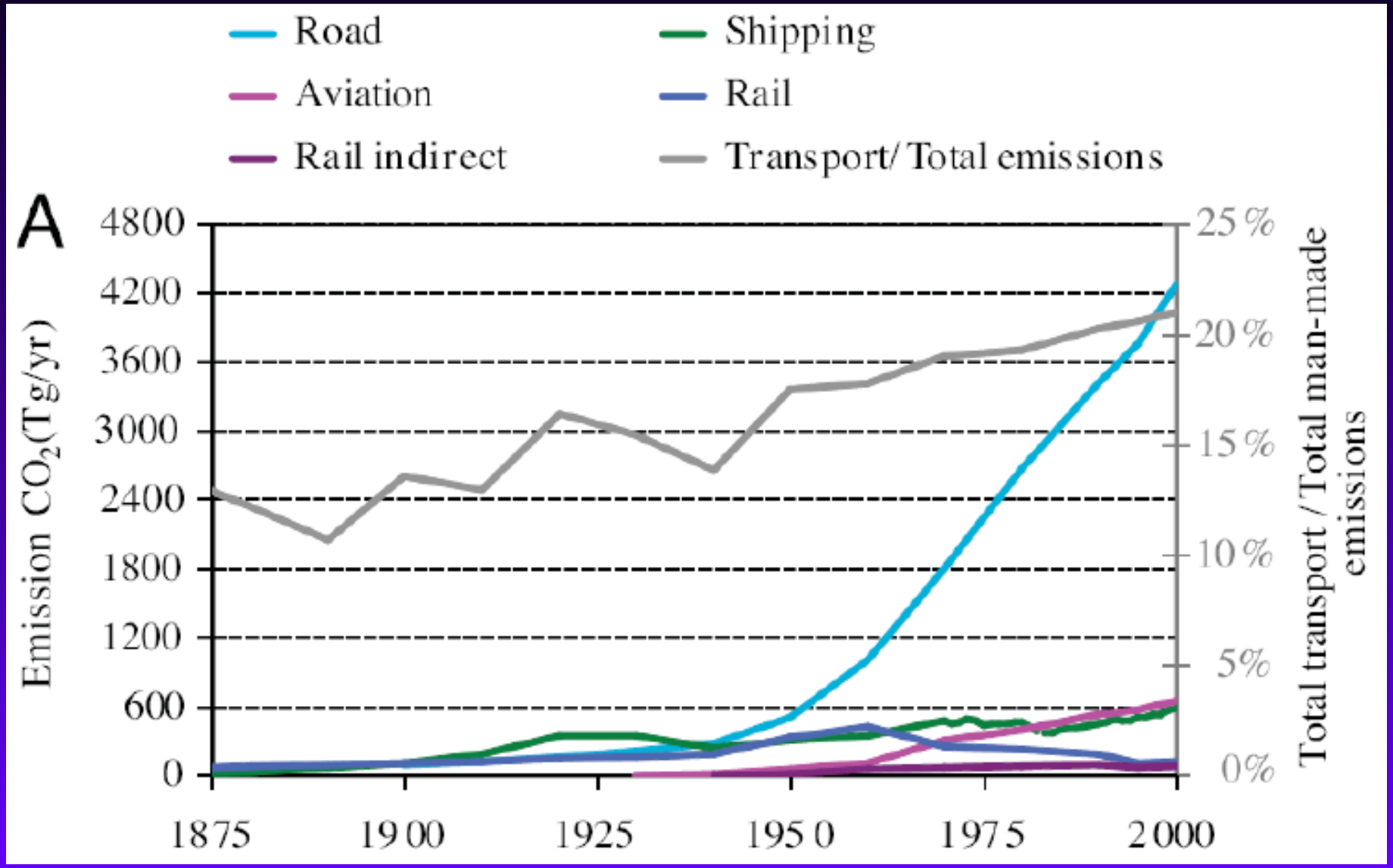
Inland Navigation Examples

Effects on Navigation Pools



Water Uses and Channel Improvements

Navigation Contribution to Greenhouse Gas (GHG) Emissions: Small But Strategic to Address



Addressing Navigation Contributions to Reduction of GHG Emissions

- Technical, operational, and transport management measures for reducing navigation GHG emissions
- Policies and instruments to create incentives for offsetting actions
- Costs and efficiency of offsetting GHG emissions
- Interdependencies between offsetting, safety, and environmental protection
- Offsetting opportunities for navigation

Conclusions

- TG3 report is fundamental for navigation to:
  - Recognize current / future climate change impacts
  - Understand different affects on maritime and inland navigation
- Informational for inland and maritime navigation in:
  - Shaping polices
  - Formulating adaptation strategies
  - Identifying offsetting measures
- Continuing dialogue required to energize response of navigation community
- Reduction of uncertainties on impacts to navigation required to identify adaptation measures
- Opportunity for navigation sector to:
  - Evaluate possibilities for contributing to reductions of GHG emissions
  - Further strive to make waterborne transport environmentally sound

Next Steps

- All PIANC commissions will use TG 3 report to further resolve relevant technical aspects related to climate change:
  - e.g. PIANC (EnviCom, MarCom) beginning new WG with IAPH on “Onshore electrical power supply” for reducing port emissions
- Communicate TG3 report and further activities via PIANC for use in relevant climate change policy activities
  - IMO, LC, EU, OSPAR, etc.

PIANC and Climate Change

Presented on behalf of PIANC EnviCom and TG 3

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